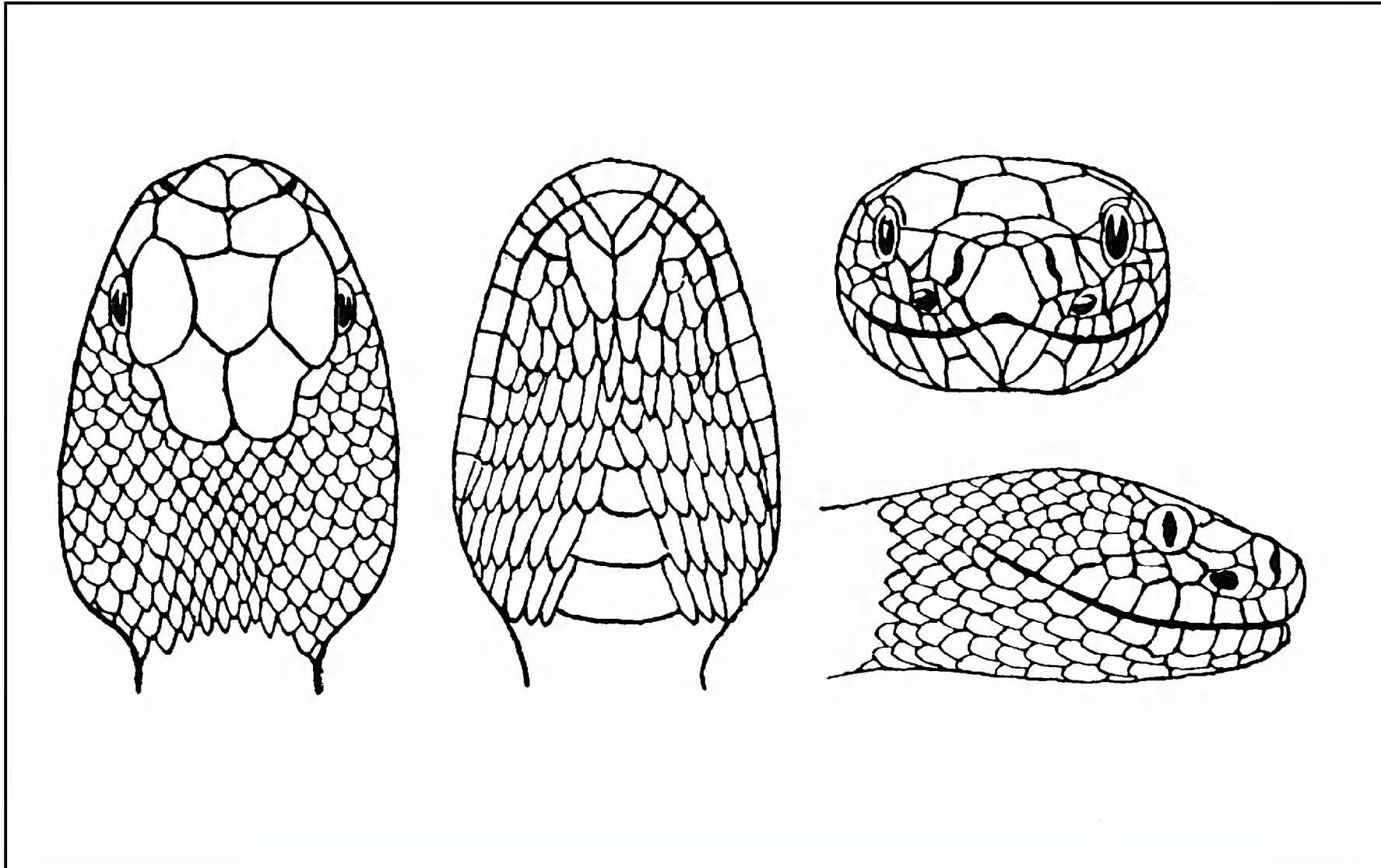

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BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
Volume 36, Number 9
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Thermoregulatory Behavior and Habitat Selection of the Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*)

David A. Wooten
Biology Department, Brooks 333
Central Michigan University
Mount Pleasant, MI 48859

Introduction

Although several taxonomic groups of snakes have been examined in reference to their thermoregulatory behavior (see reviews of Lillywhite, 1987, and Peterson et al., 1993), the bulk of the literature focuses on lizard taxa (Lacertilia), several non-viperid taxa of snakes (Elapidae, Boidae, and Colubridae) or general reptilian thermal ecology. Consequently, there is a paucity of studies directly examining the thermoregulatory behavior of pitvipers (Crotalinae).

The eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*) is a temperate pitviper that ranges from southern Ontario, east to central New York, south to Missouri and west into Iowa (Conant and Collins, 1998). Although very little is known about the thermal ecology of this snake, *S. catenatus* possesses morphological and behavioral adaptations that make it an ideal species to study in reference to thermoregulatory mechanisms. Melanistic forms of *S. catenatus* may vary in thermal preferenda in a similar fashion to those observed in melanistic *Vipera berus* (Forsman, 1995). *Sistrurus catenatus* exhibit a bimodal seasonal distribution, alternating between low, wetland areas and upland fields. Inhabiting such variable habitats, as well as acclimatizing to temperate adverse conditions, *S. catenatus* may possess compensatory thermoregulatory mechanisms for mitigating climatic stress. Therefore, this study was designed to: 1) calculate the preferred body temperature (PBT) of *Sistrurus catenatus*; 2) determine the thermal effects of substrate temperature on body temperature; and 3) ascertain the influence of thermal requirements on habitat selection.

Materials and Methods

Four *Sistrurus catenatus* were obtained from natural populations during the summer of 2000. Three individuals were obtained in southeastern Michigan (Washtenaw County) and the fourth was donated from Hartley Outdoor Center (Saginaw County). Body size (SVL) of the snakes ranged from 52 to 64 cm and body weight varied from 196 to 305 g. All snakes were kept in Neodesha® enclosures with unnatural substrate and hide boxes. Ambient temperature was held at 22–24°C, water was given ad libitum and snakes were kept on a 12:12 L:D photo regime. Snakes were offered white-strain laboratory mice once a week, but often failed to eat. No snakes were tested until three days after feeding to retard digestive effects. Likewise, any snakes that were ecdyctic were not tested until after they sloughed.

Experiments were conducted in a cardboard enclosure (122 × 30 × 46 cm) with rounded corners to prevent edge effects (Blouin-Demers et al., 2000). Seven thermal probes (four Radio Shack® digital thermometers and three YSI tele-

thermometer thermocouples) were calibrated and inserted through the back of the enclosure at substrate level. Individual probes were evenly spaced apart and taped to the middle, bottom of the enclosure. The floor of the enclosure was covered with approximately 1.5 cm of pea gravel that superficially covered all thermal probes and corresponding wires. A thermal gradient (20–40°C) was achieved by placing a reflective 150-watt infrared spotlight at one end of the enclosure (Kitchell, 1969; Lillywhite, 1980; Ludderschmidt and Reinert, 1990). A 122-cm fluorescent bulb was placed above the enclosure to ensure homogeneous illumination.

Thermal assays included the calculation of preferred substrate temperature (PST), comparisons between the variation of PST and actual body temperature, and microhabitat selection at optimal and suboptimal ambient temperature. In all tests, individual snakes were allowed to acclimate overnight (approx. 15 h) in the enclosure prior to testing. Likewise, for all tests snake temperature and/or habitat position was recorded hourly from 0800 to 1800 h. PST was based on the snakes position in the gradient and determined by recording the probe temperature that was nearest to the snake (Ludderschmidt and Reinert, 1990). If the snake was between two probes, PST was calculated as the average of the two temperatures (Blouin-Demers et al., 2000). Snakes were tested once in each of the four experiments.

Although the thermal inertia of these small rattlers is presumed to be relatively low, the substrate temperature may not precisely indicate the core body temperature of the snake. Therefore, in order to find the difference between the two temperatures, contacted substrate temperature and cloacal body temperature were simultaneously contrasted. A thermal probe with a terminal thermocouple was sterilized, inserted approximately 2 cm into the cloaca and secured with standard medical tape posterior to the opening. The extending wire was inserted out of the back, center of the arena and restricted to give the minimal amount of excess length required to move throughout the enclosure without entanglement. Data collection followed the previously described protocol.

Following these trials, the enclosure was modified to include a wetland plot complete with native plants, vegetated hummocks, cover items and standing water. The gravel substrate was kept constant to retain the same conductive conditions. The testing enclosure was then placed into an environmental chamber (Percival I-35 Incubator®) and maintained at 30°C. This allowed the snakes to select a microhabitat where all temperatures closely matched PBT. The position of the snake in reference to the type of selected microhabitat was recorded. Finally, habitat selection was again tested at a suboptimal enclosure temperature (20–22°C). Thermal probes were placed throughout the habitat to monitor microhabitat temperatures. Testing intervals followed those previously

Table 1. Preferred substrate temperature (PST) in °C. See text for details of experimental procedure.

Trial number	Snake 01	Snake 02	Snake 03	Snake 04
1	33.0	26.1	35.5	25.9
2	28.4	32.0	35.5	34.0
3	30.5	27.7	29.2	32.5
4	30.5	24.0	30.9	32.3
5	30.6	24.0	30.9	33.1
6	30.6	25.3	30.9	32.3
7	30.6	39.4	28.2	33.2
8	30.6	32.3	33.4	33.0
9	30.6	25.8	29.4	33.5
10	31.0	26.7	30.7	33.1
11	31.3	27.0	27.0	22.1
$\bar{x} \pm \text{s.d.}$	30.7 ± 1.1	28.2 ± 4.6	31.1 ± 2.8	31.4 ± 3.8

described for optimal temperature. Statistical significance was calculated using Wilcoxin Signed-Rank Test for substrate/cloacal differences. Habitat preference was analyzed by percent usage of specific microhabitats.

Results

The mean PST for all snakes tested was 30.3°C (Table 1). For body temperature assays, the mean cloacal temperature for all snakes tested was 30.0°C (Table 2). The corresponding mean substrate temperatures for all snakes tested was 29.6°C (Table 2). Snake 04 was not tested due to individual behavior that caused repeated entanglement within the probe wire. For all snakes tested, no significant difference was found between the cloacal temperature and the corresponding substrate temperature (Table 2).

For habitat preference testing, only three snakes (01, 03, 04) were used due to a debilitating health condition of snake 02. At suboptimal temperatures (22°C), snake 01 remained under the bark cover item 55% of the time, while the hummock edge was used 40% (Table 3). Both snakes 03 and 04 remained under the cover item 100% of the time (Table 3). At optimal temperature (30°C), snake 01 and 03 remained under the cover item for 82% of the time (Table 4). The remaining 18% varied between the hummock, the edge of the hummock, and the bunchgrass for each individual snake (Table 4). Snake 04 spent 100% of the time under the cover item (Table 4).

Discussion

Stevenson (1985) notes that in relation to convection and thermal inertia, ectotherms within a specific weight class (0.1–1.0 kg) have a greater potential range of body temperatures than other ectotherms below or above this range. In the present study, all snakes tested weighed 200–300 g and thus are capable of attaining a broader range of thermal conditions. In addition, the relatively small size of *S. catenatus* allows for retreat into small microhabitats where, due to their presumably low thermal inertia, thigmothermic conductance may facilitate body temperature. Larger ectotherms (>10 kg) may be restricted to environments that have smaller seasonal temperature fluctuations due to the inability to procure sufficient shelter (Stevenson, 1985). Although cloacal temperatures of *S. catenatus* were correlated with substrate temperatures, regional heterothermy in snakes is commonplace and may warrant caution in making generalizations regarding body temperature. The attenuated morphology of snakes, as well as their overall body length, facilitates regional variations in body temperature (Peterson et al., 1993). In *Masticophis flagellum*, head temperature was greater than posterior body temperature and was the primary determinant of thermoregulatory behavior (Hammerson, 1977). A similar pattern was found in *Morelia spilotes* where warmed cranial blood facilitated heat distribution to the remainder of

Table 2. Comparisons between cloacal temperature and corresponding substrate temperature (°C). See text for details of experimental procedure.

Trial number	Snake 01		Snake 03		Snake 04	
	Cloacal	Substrate	Cloacal	Substrate	Cloacal	Substrate
1	36.0	33.5	29.5	32.7	32.0	28.1
2	30.0	30.9	32.5	32.6	29.8	26.3
3	34.9	34.0	29.0	25.9	28.2	27.9
4	35.5	34.3	27.9	26.2	26.0	25.8
5	36.0	34.3	31.0	30.2	26.2	26.2
6	30.0	32.0	30.5	28.3	27.1	26.1
7	32.0	31.9	30.0	30.4	25.5	34.7
8	29.1	26.7	30.0	30.5	27.0	26.5
9	32.7	28.6	30.1	30.5	26.5	27.1
10	30.1	30.5	30.0	30.5	—	—
11	30.0	28.6	—	—	—	—
$\bar{x} \pm \text{s.d.}$	32.4 ± 2.7	31.4 ± 2.6	30.1 ± 1.2	29.8 ± 2.3	27.6 ± 2.1	27.6 ± 2.8

Table 3. Habitat preferences of snakes at suboptimal temperatures (22°C). Table entries represent percent of each snake's time using each habitat element. Habitat elements are as follows: 1) hummock; 2) edge of hummock; 3) open area near hummock; 4) bark cover item; 6) bunchgrass; 7) water.

Habitat element	Snake 01	Snake 03	Snake 04
1	0	0	0
2	40	0	0
3	5	0	0
4	55	100	100
5	0	0	0
6	0	0	0
7	0	0	0

the body (Webb and Shine, 1998). Mathematical modeling further predicts such thermophysiology (Stevenson, 1985). However, Dill (1972) found that in certain colubrids (*Pituophis* spp. and *Elaphe* spp.) the anterior and posterior body temperatures were not significantly different in either daily or over-night activity. Although not examined here, regional heterothermy must be examined before a complete understanding of a snake's thermal preferendum can be erected.

Although perhaps not holistically accurate, cloacal temperature does give a definitive temperature of a snake's body region and has been commonly used (see reviews of Lillywhite, 1987, and Peterson et al., 1993). The correlation between cloacal and substrate temperature indicates that a relatively accurate body temperature of *S. catenatus* can be extrapolated from the contacted substrate temperature. The PBT determined for *S. catenatus* (30.3°C) is similar to that of several species of viperids (Lillywhite, 1987), as well as several crotalids (Brattstrom, 1965). Although to my knowledge this is the first report calculating the PBT of *S. catenatus*, Prior and Weatherhead (1994) found that naturally occurring *S. catenatus* with a body temperature $\geq 29.0^\circ\text{C}$ would respond more readily to experimental stimuli.

Several authors have described a preference for open, lowland habitat that is adjacent to wetland areas for *S. catenatus* (Reinert and Kodrich, 1982; Seigel, 1986; Weatherhead and Prior, 1992). Although the floral composition of *S. catenatus* habitat has been described (Reinert and Kodrich, 1982), as well as the frequency of occurrence in general habitats (Reinert and Kodrich, 1982; Seigel, 1986; Weatherhead and Prior, 1992; Prior, 1996), the utilization of specific microhabitats within these areas has not been closely examined. This study found that snakes showed a substantial preference for cover items regardless of ambient temperature. Although at suboptimal temperature sedentary behavior is typical in ectotherms due to metabolic restrictions, the inactivity at optimal temperatures is a product of behavioral selection, not physiological limitations. Historically, these snakes have been observed inhabiting fossorial retreats more often than natural cover items, but within the confines of the experimental enclosure these two microhabitats were presumed equivalent (i.e., a

Table 4. Habitat preferences of snakes at preferred body temperature (30°C). Table entries represent percent of each snake's time using each habitat element. Habitat elements as defined in Table 3.

Habitat element	Snake 01	Snake 03	Snake 04
1	9	0	0
2	9	9	0
3	0	0	0
4	82	82	100
5	0	0	0
6	0	9	0
7	0	0	0

microhabitat that allowed for complete seclusion with the exception of an opening). Such cryptic behavior may be advantageous in terms of defense to such a slow-moving snake (Prior and Weatherhead, 1994). Reinert and Kodrich (1982) noted that *S. catenatus* led a relatively inactive life style and only moved an average of nine meters per day. Hallock (1991) found similar results of only 1.76–5.63 m per day.

Presumably, one could infer that *S. catenatus* may be a nocturnal species and hence the reason for the diurnal inactivity. Seigel (1986) found temporal contradictions between distant populations of *S. catenatus* and concluded that the activity may vary with both locality and season. *Agkistrodon contortrix* alters activity patterns from diurnal in spring and fall, to nocturnal in summer (Sanders and Jacob, 1981). A similar pattern was observed in *Crotalus mitchelli* (Moore, 1978). Snakes in the present study were collected during the early fall, presumably during their diurnal season. In addition to temporal variation, the specific foraging modes by which snakes locate prey will dictate their activity patterns. Huey and Pianka (1981) and Toft (1981) tabulated the criteria defining an ectothermic sit-and-wait predator. Referencing the behavioral and ecological parameters of *S. catenatus* within these criteria indicate a sit-and-wait foraging mode (as compared to a wide foraging mode). Further evidence is given by Schuett et al. (1984) who found that neonate *S. catenatus* will caudal lure, a strategy indicative of sit-and-wait foragers. Although *S. catenatus* may be aptly described as a sit-and-wait predator, such foraging behaviors are dynamic and should not be unequivocally applied to a species (Huey and Pianka, 1981). Further observations of specific feeding modalities should be examined before such distinctions can be ascribed to *S. catenatus*.

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**Book Review: *Wildlife Trade in Laos: The End of the Game*
by Hanneke Nooren and Gordon Claridge. 2001. Netherlands Committee for IUCN
304 pp. including 16 pages of color photos as well as b&w photos in text
Softcover. ISBN 90-75909-07-1. \$US31.50 from <http://www.iucn.org/bookstore/speciescon1.htm>**

**Raymond Hoser
41 Village Avenue
Doncaster, Victoria 3108
Australia
E-mail: adder@lexicon.net.au**

The main title of the book sums it up. The subtitle “The End of the Game” is a largely emotive statement by the authors. The publisher’s blurb also sums up the book’s contents when it says:

A recent study of illegal wildlife trade in Laos has concluded that this activity is out of control and amounts to a nationwide epidemic that is seriously endangering the country’s still considerable biodiversity values.

That study is of course the book itself.

The blurb goes on to say:

Virtually every animal group is being hunted for the trade. Species as diverse as elephants, large cats, deer, wild cattle, pangolins, civets, birds, lizards, snakes, turtles, butterflies and beetles bring high prices from traders. The large-scale extraction of key species is threatening the ecological integrity of the Lao forests.

Wildlife trade was also found to be jeopardizing the well-being of a significant portion of the human population of Laos. About two-thirds of the people live in rural areas and a significant proportion of these live a largely subsistence lifestyle in which wildlife is a more important source of animal protein than livestock.

According to the authors:

The majority of the wildlife taken from the Lao forests is going to China, Vietnam and Thailand, with additional important markets in Japan, Korea, Taiwan and among overseas Chinese communities worldwide. The book analyses the demand for wildlife in destination countries, and the authors state that the trade is largely driven by the Chinese market for traditional medicines and foods with supposed medicinal properties. China is both a consumer and an exporter of wildlife, often as traditional medicine products.

This accords with my own studies of the same international wildlife trade.

The authors talk about the various factors driving this international trade, including the corruption of government officials, which is essential for any major smuggling activity to continue. Noting that Laos is one of the poorest countries in the world, it isn’t altogether surprising that such corruption is rife. To this extent, this book is a refreshing change from most other publications about wildlife smuggling that pretend that government corruption doesn’t exist and that all wildlife officials are the selfless souls risking their lives and limbs and against the evil and nasty smugglers.

My own studies of smuggling operations across the globe point out the reality of government corruption in most major smuggling activity. In my book *Smuggled*, published in 1993, I noted how the trail of smuggled wildlife changes depending on the legal regimes in various countries. Examples included

the transit of stock from Latin America to Europe, within Europe and also from Thailand, which borders Laos and other parts of Southeast Asia.

These authors also note the shifts in this trade in the region as the various legal and political factors change. This includes a recent shift of this export trade from Thailand towards Vietnam. Notwithstanding this, China and the Chinese Diaspora remains the main driver of this export trade and is where most of the wildlife products seem to end up.

The authors of this book also echo other independent studies of the wildlife trade in Southeast Asia, which found that rising affluence and influence in China have driven the traders to seek ever increasing amounts and diversity of wildlife to satisfy the demand of the Chinese.

The long-term prognosis for Laos as outlined by these authors is not good. Taxa may become endangered or extinct, even before they are known to science and/or formally described and named. The same situation is echoed in other parts of Southeast Asia.

For those with an interest in the global trade in wildlife the book makes an excellent study of the wildlife trade (legal and illegal) in a Third World country. Many of the findings and conclusions of this study can be transposed with little alteration to other Third World countries, and thus the importance of this work goes far beyond what its title may initially suggest.

While the book deals with all wildlife, herpetologists should read it. That’s because the plight of numerous reptile taxa in the region is not good, with such high-profile forms as monitor lizards (Varanidae) and freshwater tortoises being in serious decline in many regions.

By way of example, a colleague of mine recently told me that in the past he would go to Southeast Asia and see hundreds of tortoises in the lakes and rivers. Now he said he couldn’t find any. He said, “It was as if someone had come in and gobbled them all up with a vacuum cleaner!” In reality, most had probably ended up on ethnic Chinese dinner tables.

As I said in *Smuggled*, the only thing that Chinese people don’t eat with legs is a table, and the only thing they don’t eat that flies is an aeroplane!

While the publicity blurb for the book talked extensively about the role of corrupt officials in terms of perpetuating the smuggling rackets, the book itself did not have a huge amount about this, save for a relatively small number of repeated references to such activity in various places and times. In my

view the authors should have been more diligent in investigating and exposing these activities, particularly due to their importance in terms of maintaining the current high volume of smuggling activity. This relative omission is particularly stark when compared with the substantial detail accorded to other less significant aspects of the Lao wildlife trade.

My other main misgivings about the book were related to the style of presentation and production in general. The front cover was relatively uninspiring and would hardly encourage disinterested persons to pick up the book. Put simply, it could have been better designed.

The paper used in the book was of relatively poor quality and based on the relatively minor costs involved in using a better grade, and that that the book should be retained as a reference source, I'd have thought a higher grade of paper would have been better.

Furthermore the layout of information and the chapters themselves sometimes made it hard to pinpoint given facts by way of a quick referral to the book. In other words a lot of good information could be lost in the detail to many who may own and be tempted to repeatedly refer to the book. I also had difficulty at times working out which information was based on fact and that which was hearsay.

However in summary, I'd suggest the book is a worthwhile addition to the library of anyone with a deep interest in the illegal wildlife trade and also enforcement personnel, particularly those from Third World countries, as well as government people involved in making laws and regulations relating to wildlife matters in these countries.

Many of the final recommendations as made by these authors for Laos are equally applicable to governments and wildlife authorities in other Third World countries.

Bull. Chicago Herp. Soc. 36(9):182-184, 2001

HerPET-POURRI

by Ellin Beltz

Not range extensions

- The alligator discovered in the sprinkler at a Sedalia, Missouri, restaurant parking lot escaped a deadly encounter with a local deputy and a shotgun when his owner appeared and begged for his pet's life. Seems the gator is one of three in a traveling gator show. Because it was 108°F on July 30, the attraction's human decided to leave the gator's traveling box open just a little bit so that it could cool off. Usually, the gator's mouth and eye restraint would have been enough to keep him immobile, but the sprinklers proved too tempting and the gator escaped. [*Jefferson City Post-Tribune*, July 31, 2001] Contributor Vicky Elwood wrote, "I found a cool spot [that 108-degree day] too!"
- New York City animal control seized a 5-foot, 40-pound, live alligator shipped overnight by United Parcel Service from a location in Georgia. Shipping live animals is prohibited by the company and the alligator was described as "not very happy" either. [*Wisconsin State Journal*, August 4, 2001, from Dreux Watermolen]
- "South Florida alligator wrestler Mike Bailey collared the 2-foot alligator living in a Central Park lake in a matter of minutes. . . . [He] hopped into a canoe with an assistant and flashlight, and paddled out into the Harlem Meer, a picturesque lake in the northeast corner of the Manhattan park . . . lunged into the reeds and emerged with the reptile in one hand. There was no struggle. He held the alligator overhead like a trophy and made a victory lap of the lake while people took pictures," according to the *Sun-Sentinel* [June 22, 2001]. He said, "Back home this is an everyday thing, but I can understand why you're all excited." The gator was taken by New York parks and sent to the Bronx Zoo even though the wrestler wanted to take it home. [June 23, 2001, both from Alan Rigerman]

A continuing inspiration

The government of Ecuador arrested the captain and 13 crew members from *Jessica*, the tanker that leaked at least 185,000 gallons of diesel fuel offshore of the Galapagos Islands. The tanker was not insured for environmental damage as it ferried fuel to the islands to support fishing boats and the tourist industry which has grown up around the wildlife which is so often described as having inspired Darwin. [January 25, 2001: New Orleans, LA *Times-Picayune*, from Ernie Liner and *Sun-Sentinel*, from Alan Rigerman]. Moving and packing brought my copy of Darwin's diaries from the Beagle trip back to the top of the bookshelf and I reread the part about Galapagos. Darwin clearly states he was notified of the differences between the tortoises and finches on the islands by local residents. Therefore, not only was he a scintilla away from missing the whole thing, but there were already people living alongside this wildlife in the 1850s and it was mostly all still there. Tortoises on the small islands were already reduced by introduced animals; but most of the islands were so unproductive and so hard to land a hand/wind powered boat on or near that he saw these islands at a unique time.

Maybe it's the algae

See if you can tease out the meaning in this quote lifted from an article about Lake Griffin, Florida, mysterious gator deaths. "Meanwhile . . . it's time to have area decision-makers take the lead in finding water supply solutions. She said the area could experience a 30-million-gallons-a-day shortfall by 2020 if steps are taken now to prevent that from happening." [*Leesburg, FL Daily Commercial* writer Jason Dehart, March 1, 2001, from Bill Burnett and Tom Huda]

Caiman raising

The Environmental department of Venezuela encouraged local crocodile hunters to become reptile ranchers to bring back the

caiman and the Orinoco crocodile, but numbers are soaring and harvest is described as a “tricky business.” One of the ranchers pointed out that if one is concerned about mad cow beef, caiman is a disease-free alternate. Local people are aware of the dangers of living by ever growing numbers of crocs, but as one said, “I would hate to see the crocodiles disappear. I want my grandchildren and their children to be able to see them.” [*South Florida Sun-Sentinel*, May 1, 2001, from Alan Rigerman]

You wanted a “gated” community, right?

An alligator in Weston, Florida, is busier than he’s ever been now that developers have carved out a network of canals and lakes in the local limestone to raise the price of “water front” lots in that community. New residents with small children and small pets in this gated and regulated community are amazed to see alligators cruising the lakes and hanging out in the canals. I guess they thought that while it might be “cool” to see deer on the lawns, the other animals would all just stop at the guarded gates for a pass. But no, and especially no, in a drought year like 2000–2001 when wildfires raged through dry grass rivers and water levels dropped. Gators migrate to stay alive and this year, 2,702 nuisance alligators were caught and killed. More than 130 have been taken out of Weston alone. One resident said, “In a way, we moved them [the gators] out to move in, but at the same time my family comes first.” [*USA Today*, July 24, 2001, from Alan Rigerman]

Tunnels of love

- Salamanders near Palo Alto’s Stanford University are getting specially installed amphibian crossings. Other salamanders in the Bay Area have roads shut down for them in migration season. [*San Francisco Chronicle*, August 30, 2001]
- The Federal Highway Administration website on critter crossings <<http://www.fhwa.dot.gov/environment/wildlifecrossings/>> highlights more salamander tunnels as well as bear bridges and underpasses. The Humane Society of the United States estimates that 1 million animals of all kinds are killed every day on U.S. roads as sprawl pushes people ever further out into formerly animal only habitat. [Leesburg, FL *Daily Commercial*, March 28, 2001, from Bill Burnett]
- *FrogLog* reports that the Declining Amphibian Population Task Force website <<http://www.open.ac.uk/daptf/>> is being updated and asks folks to check in and see what data they or their amphibian monitoring groups can provide.

Dangerous white shoes

Phil Bronstein, executive editor of the *San Francisco Chronicle* was visiting the Los Angeles Zoo with his wife Sharon Stone when a Komodo dragon apparently mistook his white sneaker shoes for white rats and bit Mr. Bronstein on the toe. The encounter, expectedly, generated much press. Zoo officials agonized whether it was better to risk big money donors and celebrities in cages or ban outright all behind-the-scenes tours. In the end, the zoo decided on liability waivers and a critical habitat examination to provide more protection for visitors. [*Miami Herald*, June 13, 2001, from Alan Rigerman and *Los Angeles Times*, June 16, 2001, from Lori King]

Give him whatever he wants

A man “last saw his beloved pet desert tortoise nearly two months ago. . . . He posted at least 50 missing signs all over the area . . . [and] had his message flashed on a local cable TV channel. It hasn’t come to milk cartons yet, but he’s close. . . . It’s hard for [the man], who thrives on stress every day as an air-traffic controller, to explain his bond with one of the planet’s most boring animals . . . [but] after a rough day keeping planes from colliding, that’s enough.” A nearby resident “offered encouraging words: ‘My three sons were so upset when they lost their turtle five years ago. It was only three inches across. They found him last month in the neighbor’s garden and he was the size of my laptop.’” [*Los Angeles Times*, June 16, 2001, from Lori King]

Rural legends in Illinois

Really and truly there was a newspaper article in the *Chicago Tribune* [June 24, 2001, from Ray Boldt] that describes downstate Illinois rural legends about the state’s little-loved Department of Natural Resources. DNR is actually a very ordinary bureaucracy—but rumors abound that it has tried to introduce various large predators in rural communities. Director Brent Manning once heard that his department was “dropping cottonmouth snakes from black helicopters to destroy [wild] turkey eggs as a method to control the birds’ population.”

Eddie still at Lincoln Park Zoo

The African dwarf crocodile at Lincoln Park Zoo is one of Chicago’s oldest zoo residents. Acquired in 1940 when he was about one foot long, he’s known only as “R-1” for “reptile number one” and is at least 61 years old. According to the *Chicago Tribune* [April 25, 2001, from Ray Boldt], some people also call him Eddie “in honor of a previous handler.” I suspect he was nicknamed after Eddie Almandarz who used to keep hot stuff by the dozens deep behind the scenes in the old reptile house (now the zoo restaurant).

Beeping Blanding’s turtles, Batman!

DuPage County headstarted Blanding’s turtles have been fixed with transmitters and released in an effort to restore this lovely, long-lived beast back to Illinois’ shallow waters. Most easily recognized by their yellow throats, this species declined during channelization and suburbanization of the Chicago region. [*Chicago Tribune*, July 6, 2001, from Ray Boldt and Claus Sutor]

The *Honolulu Advertiser* reports:

- February 25, 2001: Researchers on the 212-square mile island of Guam report population estimates from of 1 to 3 million brown tree snakes although some local people have never seen one. My handy calculator yields a ratio of 4,718 snakes to the square mile; a number so boggling I can’t imagine. Guam itself is only about 8.5 miles by 25 miles in area, similar to the Chicago Metro Region.
- March 18, 2001: About one in ten endangered olive ridley turtles to make landfall on India’s eastern coast in Orissa state were killed by people from trawlers waiting around right offshore.

- April 22, 2001: “Thousands of hatchling turtles have begun crawling from eggs on India’s eastern coast of Orissa. . . . An estimated 200,000 newly hatched olive ridley turtles have given wildlife officials hope that the breed is pulling back from the brink of extinction.”

- May 11, 2001: “More sea turtles are killed on the island of Bali [Indonesia] than anywhere else in the world — as many as 20,000 a year, . . . ” A man who owns 13 boats and employs dozens of fishermen was recently found guilty and sentenced to a year in prison. Indonesian law banned hunting sea turtles in January 1999 but didn’t enforce the ban on Bali until tourists threatened a boycott. [all from Ms. G. E. Chow]

How to have more lawsuits 101

Amphibians in the “Sierra Nevada are in danger of extinction and likely would be protected under the Endangered Species Act except for a federal moratorium on new listings. . . . Citing a backlog of lawsuits by environmentalists [the U.S. Fish and Wildlife Service] announced it would act only in response to court orders,” according to the *Berkeley Daily Planet* [June 2-3, 2001 from Greg Brim]. So a lawsuit will be filed. What a surprise. The Agency claims it needs \$120 million to “clear out a backlog of listings” and it only gets \$2 million now, with a raise to \$8.5 million under Bush’s proposal for the next Federal fiscal year. So what is all this money going to anyway? Lawyers and slowly grinding suits, not land acquisition or even creative solutions to difficult questions. Development is not going away; frogs and toads are going away while we argue the fine points.

More sea turtle tales

- “Will she or won’t she?” is the question some Maui biologists must be asking themselves right about now. Last year a green sea turtle laid eggs which hatched. She had been released near Hilo on September 11, 1981, bearing tag number 5690. [*Honolulu Advertiser*, November 2000, from Ms. G. E. Chow] Green sea turtles are notorious for only laying every other year, so she may not be back in 2001.

- Greens are also the only sea turtles known to nest in Hong Kong where conservation officers have hatched and released some marked with electronic transmitters to trace their movements. [*Albuquerque Journal*, December 24, 2000, from J. N. Stuart]

- As wind and heavy rains lashed Florida, waves damaged sea turtle nests in Fort Lauderdale. Environmental workers scrambled to relocate the eggs to higher ground. Combinations of high tides and low pressure surges swamped nests with water and ripped out sand below the eggs as tides went out. One worker said, “Looking to the right and to the left on Fort Myers beach . . . you see no nests where there was a sea of yellow tape around protected zones. It’s all water.”

How to be a numb blonde

“A man was in the hospital late Sunday after a venomous snake bit him when he picked up the cottonmouth off a Miramar street. The snake sank its fangs into [the man’s] left index finger, at which point [his] girlfriend attempted to suck out the

venom. She was treated and released with a numb mouth. However, [the boyfriend] quickly developed an allergy to the antivenin because it had been administered to him two years ago with his last snake bite. ‘Once bitten twice shy? Forget it. This guy is twice bitten and none shy,’ said [the paramedic from] the Miami-Dade Antivenin Unit, who treated him.” [*Miami Herald*, July 9, 2001, from Alan Rigerman]

Wasn’t Starbucks in the whale story, too?

The reports of *Eleutherodactylus planirostris* (greenhouse frog) continue to roll in. Extending their range to three known islands in the Hawai’ian archipelago, they are now found by the hundreds in ocean front landscaping at Wailea resort on Maui. Three populations are known on the Big Island and two have been heard calling previously on O’ahu. Hawai’i had no naturalized frogs before various *Eleutherodactylus* species arrived on non-native plants and flowers. Insect populations are expected to change radically as fast breeding amphibians eat their way through fauna in much the same way the cane toad has eaten its way across Australia. While each individual frog is small, in their native Caribbean islands, the frogs may occur at densities of about 8,000 per acre. Eggs are laid by the hundreds and each frog matures at about eight months leading to rapid population growth. [May 18, 2001] The frogs are believed to have arrived in shipment of greenhouse material, a form of controversial dispersal method called “vertebrate rafting” and recently documented in iguanas on storm debris. Previous arrivals by this method in Hawai’i include humans, dogs, cats, mongoose, rats, mice, horses and others. On the Big Island, officials tried spraying a concentrated form of caffeine to kill frogs, claiming “close to 100 percent knock-down success with one application.” [February 17, 2001] Meanwhile “state researchers have developed a process that uses hot water . . . [to] drench plants and their pots in 113-degree water for three minutes. The plant is then cooled with water at a lower temperature. . . . The heat treatment will help insure the tree frogs aren’t being spread from state nurseries to remote areas where reforestation efforts are underway.” [July 18, 2001, all from the *Honolulu Advertiser*, from Ms. G. E. Chow]

Thanks to everyone who contributed this month. And thanks to Ray Boldt, Carla and Miguel Ochoa, Ernie Liner, Marty Marcus, and Jack Schoenfelder for parts and pieces saved for next month or read and enjoyed but impossible to summarize. I really like cartoons and they find a magnetic home here, but syndication rights make them impossible to duplicate here. Also, keep those herpetological cards coming! I think I have one each of just about every herp post card out there. When we moved, Marco Mendez put them in a photo archive box and enjoyed reading about herps from Amsterdam to Zimbabwe. You can contribute, too. Send whole pages of newspapers and magazines. Make sure the date/publication slug appears on the pages (or write it on). Put your name on each piece. Mail to: Ellin Beltz, P.O. Box 934, Ferndale, CA 95536-0934. E-mails to <ebeltz@ebeltz.net>. Read all about the Wyoming dinosaur adventures at <<http://ebeltz.net/pix/wypix/wyoming.html>> and watch my website <<http://ebeltz.net>> for news from Ferndale.

The Toledo Zoo Trip

Ari Herman

It was a chilly Saturday morning. I got out of bed and, squinting, I walked over to our car, which was waiting for me, doors open. I lay down on the soft upholstery and fell asleep. On the ride to Gary, our pickup point, I slept while my dad sang “Gary, Indiana.”

I woke up parked in front of a Ramada Inn about twenty minutes later. I hadn’t eaten breakfast, so I was disappointed that the Inn’s restaurant was closed. Only one other family was there. Together, I, my dad and the other family sat on the cement base for the Ramada Inn sign.

After a short time the rest of the group arrived with the bus. Everybody got comfortable (which was easy because only half the bus was full), and the bus started to fill with conversations of herps and herpin’. Reptile related movies such as “Lake Placid” played on the several screens on the bus throughout some of the ride (of course we all cheered for the reptiles).

When we arrived at the Toledo Zoo, Char Haguewood, the organizer of the trip, led us into the reptile house where Andy Odum, Curator of Herpetology, told us about the building and how it was made. The building’s aesthetic qualities came from the impressive stone, hand crafted by the WPA, and from its beautiful displays, designed by the zoo’s keepers.

He also said very proudly that Roger Conant, whose very first zoo job was in Toledo in the early 30s, had designed the reptile house. Roger, of course, is well known to all of us as the author of *A Field Guide to Reptiles and Amphibians of Eastern and Central North America*.

After he finished talking, we were split into two groups and taken by Kent Bekker and by Greg Lips, two of the really friendly keepers at the zoo, through doors to the behind-the-scenes area of the reptile house.

Behind the door was a long hallway where all the maintaining of the cages and caring for the animals was done. On one wall the back doors of all the cages, each with a little window for looking at the reptiles, were efficiently lined up at eye level. Each door had a card next to it with feeding and maintenance instructions for that animal. The color of the card indicated venomous (red) or nonvenomous (green).

As we went down the hallway we saw some interesting things: a refrigerator with over three hundred antivenoms, a room with a UV-permeable skylight for UV-loving animals and the manager’s old office — a loft which could only be accessed by means of an uncomfortable looking, sheer vertical ladder.

Finally we came out on the other side of the hallway. Sitting down we plotted the second half of our adventure, going to Frogtown.

Behind the scenes in Frogtown . . .

In a big red building with an assortment of different animals we visited Frogtown.

Frogtown was the old nickname for Toledo because of its numerous frog species. Toledo had so many frogs that the loud croaking kept the people awake at night (of course, this is no longer a problem, courtesy of habitat destruction and pollution).

From the point of view of the visitor, Frogtown appeared like any other exhibit, but behind the scenes we could see more. Walking behind the scenes through the lengthy passageways hidden behind the walls a complex system for heating, humidifying and maintaining the cages in every way possible was revealed to us.

Behind one door we found elaborate displays of juvenile amphibians, behind another, a cooled-down room for animals from cooler areas of the world (and maybe for hibernation). The building had more than just frogs. It contained exhibits of salamanders, fish, koalas, and, interestingly, the rare tuatara!

Tuataras are the only remaining species in their family. Only a handful exist in the world, and even those are in trouble. Tuataras are found in protected areas on the island of New Zealand and are dispersed in zoos for captive breeding programs and for rare glimpses at a vanishing creature. Sadly, captive propagation seems not to be doing the trick, and we all realized how lucky we were to see the animals.

The last item on our agenda was the independent exploration of the rest of the zoo. This turned out to be just what I needed. We went first to the aviary. The first room in the birdhouse had common birds like cardinals, robins and jays.

In the second room the environment was arid. Colorful birds flew around, barely missing our heads, and little green and red birds would enter and leave through little holes in the wall.

One bird that looked like a squashed, darkly colored toucan, had a nest inside a birdhouse. He (or she) would start squawking up a storm whenever someone passed by. The afternoon was a lot more leisurely than the first part of the trip. It gave me a chance to look at the beautiful exhibits in much more depth.

Before we knew it, it was time to go. We headed back to the bus, noting the exhibits that we *hadn’t* gotten to see. I realized how much fun I’d had and how much I’d learned on the trip, and, looking at all the empty seats on the bus, I realize how many people had missed out!

Herpetology 2001

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

MOVEMENTS OF HOGNOSE SNAKES

M. V. Plummer and N. E. Mills [2000, J. Herpetology 34(4): 565-575] monitored movements and survivorship of eight resident and eight translocated adult *Heterodon platirhinos* with daily radiotelemetry during the activity seasons (15 April–15 October) of 1992 to 1994 in upland open forest habitat. Hognose snakes were diurnally active and used a variety of open and edge microhabitats with grassy or leafy groundcover. Resident snakes were active on about 57% of days but some were inactive for extended periods (up to 68 d) in midsummer. Residents confined their movements within large ($\bar{x}$ = 50 ha), well-defined home ranges which, for individuals, remained similar in size and location from year to year. Movements of both resident and translocated snakes averaged approximately 120 m / d, but movements of residents were confined to home ranges whereas those of translocated snakes were not so confined. Compared to residents, translocated snakes exhibited a 6× greater variance in distance of daily movements and made most of the long (>400 m/d), unidirectional movements. Resident snakes survived, on average, more than 3× longer ($\bar{x}$ = 122 d) than translocated snakes ($\bar{x}$ = 36 d) within the 184 d annual activity season.

SPADEFOOT LARVAL PERIODS

D. R. Buchholz and T. B. Hayes [2000, Herpetologica 56(4): 455-468] note that the spadefoot toad *Scaphiopus couchii* lives in desert environments and has the shortest larval period known among anurans. The authors compared the larval period of *Sc. couchii* with that of a sympatric relative, *Spea multiplicata*, under identical laboratory conditions. It was possible that (A) *Sp. multiplicata* might metamorphose as fast as *Sc. couchii* when both taxa were reared under the same conditions, because larval periods are phenotypically plastic, or (B) *Sc. couchii* might metamorphose more quickly even under identical conditions due to taxon-specific physiological control of larval period length. Six clutches of *Sc. couchii* and *Sp. multiplicata* were reared under laboratory conditions, varying in temperature, food type, and density to test for differences in growth and development between these taxa. Rearing conditions affected the larval period in both species, but within each condition, *Sc. couchii* developed 1.2–1.5 times faster and metamorphosed 4-6 days earlier than *Sp. multiplicata*. Also, *Sc. couchii* grew 2–3-fold slower in body and tail length and 10–20-fold slower in mass and metamorphosed at half the length and about 14% the mass compared to *Sp. multiplicata*. Because no rearing condition altered the rank order differences between taxa in growth and development, these taxa may differ in physiological mechanisms underlying larval period lengths. The authors discuss these consistent differences between taxa in terms of their physiological, ecological, and evolutionary significance.

INCUBATION TEMPERATURE DETERMINES SEX IN AUSTRALIAN ROCK DRAGONS

P. S. Harlow [2000, Copeia (4):958-964] notes that rock dragons are medium-sized agamid lizards restricted to arid or semiarid rocky habitats in southern Australia. When eggs from two species (*Ctenophorus decresii* and *Ctenophorus ornatus*) were incubated at constant temperatures in the laboratory, temperature affected incubation period, hatchling tail length, and sex determination. At the lowest incubation temperature (25°C), all hatchlings were female; the proportion of males increased at higher incubation temperatures. Rock dragons are fast growing and short-lived lizards; in the field they reproduce for only one or two seasons. Females lay multiple clutches of eggs from spring through to late summer which, in the climatically temperate part of Australia where these species occur, suggests that the date of hatching may be a good predictor of hatchling sex. Any sex differences in hatching date would, in turn, translate into sex differences in body size at the beginning of the next reproductive season. If the relationship between body size and reproductive success differs between the sexes in adult rock dragons, this would provide a plausible basis for the evolution of temperature-dependent sex determination in these species.

REMOVAL SAMPLING OF SALAMANDERS

J. W. Petranka and S. S. Murray [2001, J. Herpetology 35(1): 36-44] surveyed a streamside community in a southern Appalachian old-growth forest to determine the feasibility of using removal sampling to estimate salamander density and biomass. They removed salamanders during 21 nightly searches of two 30 × 30 m plots from 29 June to 20 July 1999. Despite the removal of 2,433 animals and a lack of evidence for significant trespass onto plots, there was no overall decline in total catch per night. Moisture levels associated with recent rainfall history strongly influenced the surface activity of small species (*Desmognathus carolinensis*, *Desmognathus wrighti*, *Eurycea bislineata wilderae*) but not large species (*Plethodon jordani*, *Plethodon glutinosus*, *Plethodon yonahlossee*). More refined analyses of individual species using either regression analysis (large species) or covariance analysis (small species adjusted for moisture conditions) indicate that the catch of all species except *D. wrighti* declined with time. The estimated number of consecutive nights required to remove 70% of the population varied from eight (*P. yonahlossee*) to 32 (*D. carolinensis*) and tended to be inversely related to the body size of the species. Conservative estimates of total salamander density and wet biomass in streamside habitats at this site are 18,486 individuals and 16.53 kg per hectare. These values are seven and 14 times greater than those reported for the Hubbard Brook Experimental Forest in New Hampshire and underscore the importance of salamanders in riparian zone communities of southern Appalachian forests.

MINNESOTA BLANDING'S TURTLES

M. J. Pappas et al. [2000, *Chelonian Conservation and Biology* 3(4):557-568] report that the population of Blanding's turtles (*Emydoidea blandingii*) at Weaver Dunes, Wabasha County, Minnesota, may be the largest in the world. The Weaver Dunes complex is composed of Weaver Bottoms which is a 1620 ha shallow lake, the old Zumbro River Channel (1500 ha consisting of approximately 750 ha of wetland habitats), and Weaver Dunes (600 ha of stabilized dunes). Between 15 April 1974 and 1 June 1980 the authors marked a total of 2402 individuals and made 474 recaptures. An additional 49 females were marked in June 1998 and 25 recaptures were made of previously marked individuals. Clutch sizes were determined for 44 females during 1976 and 1977 and for 70 females during 1998. Adult females averaged 197.0 mm carapace length (CL) and 1.08 kg in body mass; adult males averaged 213.6 mm CL and 1.29 kg in body mass. Compared to males of similar length, plastrons of females were wider and total shell width was narrower and higher. Of 598 reproductive females, fewer than 20% were captured on land during the nesting season in successive years, and some females appeared not to reproduce each year. Clutch size averaged 9.8 eggs and was positively related to body size of females. Eggs averaged 23.5 by 37.5 mm, and hatchlings captured in the field averaged 33.1, 36.7 and 15.4 mm in plastron and carapace length and shell height, respectively. Females matured at a minimum CL of 160 mm and minimum age of 14 yrs. Juveniles averaged 10 mm/yr increase in CL. The oldest adults in the population were a minimum age of 40 to 45 yrs. Adult growth averaged 0.46 mm/yr, with some adults exhibiting zero or negative growth. Juveniles comprised 35.1–55.7% of samples of turtles. Adult sex ratio was 1 male to 2.2 females. Emergence of adults from overwintering occurred between 13 March and 8 April. Nesting began between 26 May and 12 June, and nesting season duration averaged 17 days. Hatchling emergence averaged 27 days between mid-August and late September. Since 1.6% of hatchlings were captured on land in the spring following nest construction, some hatchlings apparently overwintered on land. First order estimates place the population size of Blanding's turtles at between 2500 to 4600 individuals on the west side of Weaver Dunes alone (the old Zumbro River Marsh area).

SEXING CAPTIVE-BRED PLOUGHSHARE TORTOISES

G. Kuchling and F. J. López [2000, *Dodo* 36:94-95] report that ploughshare tortoises (*Geochelone yniphora*) have a long juvenile phase (about 20 years) and cannot be reliably sexed externally before they reach maturity. Therefore, 60 juvenile, captive-bred *G. yniphora* (310–3750 g) were endoscopically sexed between 30 April and 5 May 2000. Results show that the Durrell Wildlife Conservation Trust's captive breeding project at Ampijoroa has successfully produced both sexes: of 60 juvenile tortoises, ten were males, 49 females and one an intersex. The females came from 38 different nests, the males from six nests, the intersex was from a nest on its own. As no male and female originated from the same nest, all nests may have produced only one sex. These results suggest that *G. yniphora* has temperature dependent sex determination.

MIDWIFE TOAD BURROWING BEHAVIOR

L. E. Brown and E. G. Crespo [2000, *Alytes* 17(3-4):101-113] note that the European midwife toads, *Alytes cisternasii* and *Alytes obstetricans*, are fossorial anurans that primarily use their forelimbs in burrowing. The maneuverings are quite dexterous and the forelimbs are used alternately or sometimes synchronously. The fingers (particularly III and IV) are oriented downward and scraped into the substrate. Occasionally the head is pushed into the substrate or acts in a scoop-like manner. The toads construct a system of tunnels and cavities underground. They do push-ups packing the substrate against the top of the tunnel with their head. The toads also vocalize and form aggregations (2–5 individuals) underground suggesting social interactions. The two species are quite similar in motor patterns of forward burrowing. However, *A. cisternasii* makes minimal use of its hind limbs (only for bracing), whereas *A. obstetricans* actively uses its hind limbs to kick soil posteriorly that was brought to the surface by the forelimbs. Also, *A. cisternasii* is a rapid, efficient forward burrower and is highly fossorial, whereas *A. obstetricans* is a reluctant forward burrower that lingers on the surface and prefers pre-existing holes. Differences in burrowing behavior of the two species are correlated with differences in morphology and habitats occupied. In four instances in which the burrowing of male *A. obstetricans* carrying eggs was studied, no differences were observed in motor patterns from other adults not carrying eggs. Kicking of the hind legs was carried out in a manner that assured the egg masses were not damaged. It is probable that the main reason forward burrowing evolved in *Alytes* was to assure subsurface concealment because of the involvement of the male's hind limbs in parental care.

DIET OF MICHIGAN RIBBON SNAKES

J. W. Rowe et al. [1999-2000, *Herpetological Natural History* 7(2):145-152] studied dietary composition of *Thamnophis sauritus septentrionalis* ($n = 310$) at Miller's Marsh on Beaver Island, Michigan. Snakes consumed mostly adult or juvenile *Pseudacris crucifer*, which were found in 50.9% of all individual stomachs. Recently metamorphosed *Ambystoma* spp. and *Notophthalmus viridescens* were found in 32.7% of all stomachs while adult *N. viridescens*, *Plethodon cinereus*, *Hyla versicolor* and *Rana sylvatica* and larval or recently metamorphosed *Bufo americanus*, *H. versicolor*, *R. clamitans* and *R. sylvatica* comprised the remaining 16.4%. Seasonal variability in prey item composition was apparent during the summer months, as individuals ingested primarily adult *P. crucifer* during early summer and, switching to mainly emerging juvenile frogs, toads and salamanders later in the summer. Prey item length and mass were both significantly correlated with snake size and the variance in prey item size increased with increases in snake size. Therefore, relatively large snakes tended to ingest larger prey item types (e.g., juvenile *Rana clamitans*) more frequently than did relatively small snakes while small snakes ingested relatively small prey items (e.g., emergent *P. crucifer*) more frequently than did larger snakes. There were no significant differences in prey item size between adult females and males despite significant sexual size dimorphism.

CHASSAHOWITZKA HERPETOFAUNA

K. M. Enge and K. N. Wood [1999-2000, Herpetological Natural History 7(2):117-144] conducted a herpetofaunal survey for 200 days in Chassahowitzka Wildlife Management Area, Hernando County, Florida, using three drift-fence arrays per habitat in five terrestrial and five wetland habitats. The arrays captured 4725 amphibians and 1675 reptiles apportioned among 16 anuran, seven salamander, five turtle, one crocodilian, eight lizard, and 24 snake species. Eight species represented new county records, including a range extension for *Regina rigida*. Numbers of anuran captures differed among wetland but not terrestrial habitats, despite over three times more amphibians being captured in xeric hammock than in any other terrestrial habitat. More anurans were captured in wet prairies than in depression marshes. The most productive habitats were basin and dome swamps for salamanders and depression marsh for turtles. In terrestrial habitats, lizards were captured most frequently in upland mixed forest and sandhill, whereas hydric hammock was the most productive wetland habitat. There were no differences among either terrestrial or wetland habitats in numbers of snakes captured. When water was > 30 cm deep around wetland drift-fence arrays, most aquatic snakes and salamanders were trapped, but turtles, semiaquatic anurans, and adult *Hyla* spp. were also frequently captured. Lizards, semiaquatic snakes, and terrestrial and semiaquatic anurans were captured most often when wetlands were dry. Weekly amphibian capture rates were positively correlated with both precipitation and lowest minimum air temperature, whereas reptile capture rates were only correlated with lowest minimum air temperature. On average, 82% of the species captured in each habitat were detected during the first two months of trapping. *Rana capito*, which was common at Chassahowitzka, bred in October, and metamorphs dispersed from depression marshes and wet prairies the following May and June. The highest amphibian species richness (13–16 species) was recorded in wet dome swamp, basin swamp, and xeric hammock, and the highest reptile species richness (17–19 species) was in wet prairies sandhill, hydric hammock, and depression marsh. Mean amphibian species richness per array was significantly higher in xeric hammock than in all other terrestrial habitats except sandhill. There were differences in mean amphibian species richness among wetland habitats, but no single habitat was significantly different from all other habitats. There were no significant differences in mean reptile species richness among terrestrial or wetland habitats. Sandhill, xeric hammock, and mesic flatwoods had similar amphibian assemblages but dissimilar reptile assemblages. The conservation value of habitats based on occurrence of unique species indicated that sandhill and mesic flatwoods had the highest value for reptiles, which was warranted because of the presence of rare and/or protected species. Upland mixed forest and xeric hammock had the highest conservation value for amphibians, but the value for upland mixed forest was unwarranted because it was primarily based on the capture of the only *Hyla cinerea*, a common species infrequently captured by drift fences. The herpetofaunal diversity of the area resulted from the mosaic of terrestrial and wetland habitats present.

DO WIRE CAGES PROTECT SEA TURTLE NESTS?

M. L. Mroziak et al. [2000, Chelonian Conservation and Biology 3(4):693-698] report that all sea turtle nests at Boca Raton, Palm Beach County, Florida, are exposed to foot traffic from visitors that use the beach, and to predators (raccoons, foxes, and skunks) that feed upon the eggs and hatchlings. To protect the nests, managers have covered them with square wire cages anchored in the sand. The authors compared the fate of caged and uncaged nests exposed to high and low levels of foot traffic, and to high and low levels of predation. They found no evidence that foot traffic posed a threat to the nests. Predators (mostly raccoons) used the cages as landmarks to locate nests. Predators reduced hatchling productivity on the beach more during the year of the study (1996) than during the following year when cages were not used. The authors conclude that the cages used failed to protect the nests. They recommend that at this and at other sites where similar conditions exist, management efforts should shift away from efforts to discourage mammalian predators and toward efforts to reduce predator populations adjacent to the nesting beach.

FLAT-TAILED TORTOISES IN CAPTIVITY

O. C. Razandrimamilafiniarivo et al. [Dodo 36:75-81] note that the Madagascar flat-tailed tortoise or *kapidolo*, *Pyxis planicauda*, is found only in a diminishing area of dry deciduous forest in west Madagascar. The habitat is under continuing threat from burning for cultivation and recently the tortoise has come under threat from collection for the exotic tortoise pet trade. In 1989 Durrell Wildlife Conservation Trust started a captive breeding project for this threatened species at the Chelonian Captive Breeding Centre at Ampijoroa Forest Station in Mahajanga Province, Madagascar. The authors describe the maintenance of these tortoises in captivity and the results of this project from 1995 to 1999. Following the death of several juveniles, seven adults (3.4) and seven juveniles remained at Ampijoroa prior to the 2000 breeding season.

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For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. We feed our colony a nutritionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. Mice starting from: pinks, \$.17 each; fuzzies, \$.24 each; hoppers, \$.30 each; weanling, \$.42; adult, \$.48. Rats: starting with pinks at \$.45 each, to XL at \$1.80 each. Discount prices available. We accept Visa, MC, Discover or money orders. P.O. Box 85, Alpine TX 79831. Call us **toll-free** at (800) 720-0076 or visit our website: <http://www.themousefactory.com>.

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For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice available: small newborn pinks up to jumbo adults. Prices start at \$25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: All of the following turtles are captive bred from my personal collection of legal North American wood turtles—c.b. 2001 hatchling NA wood turtles, \$65 each; c.b. 2000 hatchling NA wood turtles, \$75 each; c.b. 1999 hatchling NA wood turtles, \$100 each. All are feeding well on Reptomin as well as live food items. Please call or E-mail me with any questions at (616) 363-9276 or innovativelaser@home.com.

For sale: Prehensile tail skinks, one breeding pair, also 6 females, 1 male, with or without custom cages. three *sulcata* tortoises, ages 3–6 years. (815) 899-9972. E-mail: guano624@hotmail.com.

For sale: Adult pair of Durango mountain kingsnakes (*Lampropeltis mexicana greeri*), \$200 for both, and 2001 feeding hatchling, \$45; adult male Chihuahua mountain kingsnake (*L. pyromelana knoblochi*), beautiful snake, \$200. Chicago area pick up only. Mark Dieterich, (847) 570-0239. E-mail: MarkDieterich@msn.com.

For sale: '01 c.b. hatchling snakes: eastern milk, Sinaloa milk, Honduran milk, Stuart's milk, Arizona mountain king, Yunnan beauty. Available late summer through early fall. Reasonable offers for small quantities. Henry Cohen, 24 St. Johns Place, Buffalo NY 14201, (716) 881-6724 (mornings).

For sale: Garter snakes: **Snow Plains**—Limited numbers available, 2.1 \$750, 1.0 \$250, also 1.2, The male is a c.b. 2001 snow, both females are '98 proven adult double het snow plains, flawless and eat frozen thawed. Statistically these should produce 50% snows and 50% hets, \$525/trio includes shipping to your door. **Albino Plains**—White with lavender intermixed, \$125 each/\$225 a pair (limited numbers available). **Anerythristic Plains**—A must ingredient to create snows. Dark morph with grayish dorsal stripes and bluish ventrals and dark eyes. Males, \$35, Females, \$90 **Buy 4.1 for \$175, includes shipping (some of these are large enough to feed upon runt pinks). **Erythristic × melanistic**—These are out-crosses from breeding high red Easterns to melanistics—very sharp! \$175/pair. **Blais red flame (high end) × melanistic (double het)**—As babies mature they MAY turn peach in color, \$30 each, \$50 per pair. **Melanistic**—Reverse trios (2.1) only available, \$80/reverse trio. **Eastern garters**—\$25 each/2 for \$40. **Possible het anerythristic red-sided**—These are 66% chance for being het for anerythristic. These look identical to normal red sideds, 2.1 \$60, (includes shipping to your door). Buy four males and one female for \$90 (includes shipping to your door)** **ADULTS**—four proven double het snow Plains—These have produced snows, albinos, anerythristics, hets and normals, \$175 each, all 4 for \$500. Buy all 4 and I'll include one c.b. 2001 anerythristic male (66% albino) **AND** one c.b. 2001 albino male (66% anerythristic) @ no charge. Shipping charges are extra unless noted. Pictures of most can be seen at our website: <http://www.thamnophis.com/features/ScottFelzer>. Scott, (919) 934-0110. (North Carolina). Email: Sirtaliso1@aol.com.

For sale: hi-orange western phase womas, c.b. 4/15/01 and 4/30/01, \$2000 per pair or lone males for \$850; nice pink and grey Argentine boas, c.b. 6/10, \$90 each; yellow anacondas, jet black spots on canary yellow bodies, c.b. 6/01, only \$75 each; Amazon tree boas, c.b. beauties, born right here 6/23/01, different colors, \$50-200 depending on color; red blood pythons, fat and hardy little monsters, c.b. 5/01, \$125 each or \$200/pair. Coming soon: red and orange phase Brazilian rainbows and Dumeril's boas both due in August. All babies will be healthy, feeding and captive born. Mark Petros, Strictly Serpents, (847) 836-9426, E-mail: MLPserpent@hotmail.com.

For sale: Send SASE to CRC, P.O. Box 0731, Las Vegas NV 89125-0731 for brochures and list of species available. Limited bookings available for guided tours of herpetological collection sites in Nevada. Call/fax (702) 450-0065. URL <http://www.herp.com/crc/> E-mail: crsafetie@aol.com.

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Wanted: Aberrant/unusual garter snakes. Scott, (919) 934-0110 (Eastern Time).

Wanted: west Florida reptile collector would like to hear from other reptile collectors from all parts of the U.S. to trade, buy, sell reptiles of all types. Tony Picheo, 11080 lillian Hiway, Pensacola FL 32506, (850) 453-8133.

Wanted: big-headed turtles; mata mata turtles; Mexican giant mud turtles (*Staurotypus triporcatus*); exceptionally large common snappers (45 lbs. & up); large alligator snappers (over 90 lbs.); spectacled caiman from Trinidad, Tobago and Surinam; dwarf caiman; smooth-fronted caiman; albino turtles (except red-eared sliders). Walt Loose, (610) 926-6028, 9:00 A.M. – 1:00 P.M. or after 11:30 P.M. Eastern Time.

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: <MADadder0@aol.com>.

Unofficial Minutes of the CHS Board Meeting, August 17, 2001

Vice-president Lori King called the meeting to order at 7:33 P.M. Board members Dan Bavirsha, Rich Crowley, Char Haguewood, Jack Schoenfelder and Steve Spitzer were absent.

Officers' Reports

Recording Secretary: Emily Forcade distributed and read the minutes of the July board meeting. Corrections were made and the minutes were accepted.

Treasurer: Greg Brim distributed the treasurer's report. He said that our income and our expenditures for the year are in balance, as they should be for a not-for-profit organization. The income tax report for 2000 was submitted on time.

Membership Secretary: Mike Dloogatch distributed the membership report. Membership stands at 802.

Vice-president: Speakers for September and October are not definite yet. The Utila Island Conservation Project is going well. The International Iguana Foundation asked Gunther Kohler if *Ctenosaura bakeri* could be included on their logo. Lori showed the board a picture of the logo with *C. bakeri* prominently on display.

Publications Secretary: Greg Brim has sent Chris Lechowicz some additional software he might be able to use for the website. There was a lengthy discussion during the meeting. It included both the concerns about the website as well as how these concerns should be addressed. In the end, Lori suggested that we proceed with the idea that several of the computer skilled members meet to do a comprehensive identification of proposed changes. There would be several action plans to follow once these are identified.

Standing Committees

ReptileFest: Darin Croft was not present. He has been told that the dates we wanted to schedule for the Fest are not available at the University of Illinois. He is discussing alternative dates with them.

Grants: Mike Redmer reported that the committee is working to revise the guidelines for grant applicants.

Shows: Jenny Vollman said that we will be participating in the City of Chicago's Nature Walk at Navy Pier on September 22–23 and on September 29–30. One of our members, Jim Finn, who did a video on the Toledo Zoo trip, has asked for our participation at a film festival at the Harold Washington Center. Details are pending.

Adoptions: Linda Malawy is now the person officially in charge of adoptions. Rich Crowley will continue to be involved as a back up. Ron Humbert has offered to help, especially with turtles. He raised some concern about the amount of work this committee would involve for the chairperson. Linda said that she has cultivated a number of resources and has found the experience to be quite manageable. Any questions that come in regarding green iguanas should be directed to her. She is working to provide much needed husbandry

information to the callers and has been able to help some owners keep rather than donate the iguanas they already own.

Ad Hoc Committees

Symposium 2001: Lori reported that the fliers are being included in the August *Bulletin*. They are also available to anyone who knows of potentially interested parties. The September symposium meeting has been changed. It will meet at Gary Fogel's home. The October meeting will be held at Mike Dloogatch's office.

Facility: Lori said that August might be our last month in the large auditorium. We can anticipate beginning to have our general meetings in the second floor McCormack Room at the Peggy Notebaert Nature Museum as early as September.

Salamander Safari: Ron Humbert said he has heard nothing in response to our letter to Cook County. He has had several offers to do the safari in another county, but he will wait until January 2002 to decide.

Old Business

Animal of the Month: Ron Humbert said that the announcement of the August animal (corn snake) didn't make it into the *Bulletin*. The group discussed possible candidates for the coming months and decided on North American box turtles for September and green iguanas for October.

New Business

There was a brief discussion about what to do with the complete set of CHS *Bulletins* that Ellin Beltz donated. There was a general sentiment that the CHS should maintain a complete set in its possession, although there are still ways we can provide wider access to them. These include putting them online or having them housed in the library at the Field Museum. A final decision will await discussion at another time.

Lori distributed a proposal from Rob Carmichael to allow for the display of venomous snakes at CHS sponsored events. Rob will attend the next board meeting to discuss this proposal. Ron Humbert said he would get our insurer's position about this in writing.

Rich Crowley is able to produce the CHS logo as stick-on decals. A sample was viewed by the board members, who all responded favorably. It was suggested that these could be used for fund-raising. Mike Dloogatch made a motion to allot \$60 for the production of the stickers. Jenny Vollman seconded the motion. The motion carried unanimously.

Ideas and Suggestions

Emily Forcade suggested that there be a website announcement that corn snakes were the Animal of the Month for August, since this wasn't announced in the *Bulletin*. It wasn't clear if this could be done.

Round Table

Mike Redmer asked if we ever got calls reporting rattlesnakes. The Department of Fish and Wildlife is interested in developing a protocol regarding how rattlesnake reports are dealt with. He asked to hear about any such calls if they are received in the future.

Mike Dloogatch said he received information about a data base system that can be used for keeping herps. If anyone is interested in this they can contact him.

The meeting adjourned at 8:59 P.M.

Respectfully submitted by Recording Secretary Emily Forcade

Bull. Chicago Herp. Soc. 36(9):191, 2001

News and Announcements

2002 CHS HERPETOLOGICAL GRANTS PROGRAM

The Chicago Herpetological Society announces the 2002 CHS Herpetological Grants Program to award financial support for herpetological research, education and conservation. Several awards of up to \$500 each will be available. Interested parties may apply for a grant in any one of the following categories:

1. Illinois Herpetology
2. Graduate Student Research in Herpetology
3. Undergraduate Research in Herpetology
4. Conservation
5. Captive Management, Husbandry, and Propagation

An attempt will be made to award grants in each category, but depending on the applications received, not all categories may receive awards. Some categories may receive more than one award. The Grants Committee reserves the right to reassign the category under which a given proposal is submitted.

Applicants must be members of the Chicago Herpetological Society as of December 31, 2001. In accepting a grant, the recipient agrees to abide by all state and federal laws, and to acknowledge the Chicago Herpetological Society in any publications that result from the subsidized research. Recipients are encouraged to submit their work as an article for the CHS *Bulletin*, or to present a program at a CHS general meeting.

Applications should include the following:

1. Statement of the objectives of the proposal, and a statement of under which of the above categories the proposal is being submitted.
2. Description of materials and methods.
3. Complete budget, not to exceed \$500.
4. Brief resumé of the applicant, if an individual. If the applicant is an organization, background information on that organization should be included.
5. Letters of support from collaborating partners or institutions are encouraged; student applicants must include a letter of support from a faculty adviser.
6. Anticipated completion date for the project.

Applications may be either mailed to the CHS at the address below or submitted by E-mail (letters of support, however, should be sent by mail). Mailed applications must be typed, double spaced, and submitted in duplicate. Applications (aside from supporting materials) should be brief and simple; proposals longer than three to five pages are discouraged. All applications must be received by 31 December 2001, and awards will be announced by 15 February 2002.

It is the goal of the Grants Committee to award grants to a variety of applicants; enthusiastic amateurs will receive equal consideration with professional herpetologists and graduate students. Topics that might translate into quality CHS *Bulletin* articles or monthly meeting programs are favored, though not requisite.

Submit typed applications to: Chicago Herpetological Society, Grants Program, 2060 N. Clark Street, Chicago IL 60614. Submit E-mailed applications to CHSGrant@aol.com.

Questions may be directed to Michael Dloogatch, (773) 588-0728, or to Michael Redmer, CHSGrant@aol.com.

News and Announcements (cont'd)

HERP OF THE MONTH

To promote attendance at the CHS monthly meetings, the Board of Directors has agreed, on a trial basis, to offer a new monthly feature known as "Herp of the Month." Each monthly meeting will showcase a different herp and CHS members can bring one specimen of the "Herp of the Month" to be judged against other entries from other CHS members. Ribbons and/or trophies will be awarded to the top three winners.

Judging criteria will include: Health and general condition; Color; Alertness; Personality; and Attractiveness.

As with any competitive event certain rules must apply. It is the consensus of the board that the fewer rules, the better. As this is a new venture, experience may dictate the future need to change or add rules. For now, however, the rules will be as follows:

1. One entry per person.
2. Owner must be a CHS member.
3. Entry must be contained in a secure enclosure. Enclosure furnishings are to include only items necessary for the short-term welfare of the specimen.
4. Container must identify species by both common and scientific name and owner should know these names.
5. If possible, gender of specimen should be indicated.
6. Container should be labeled if specimen is aggressive or unpredictable in behavior considering the species involved.
7. Specimens will be disqualified from judging if judges find specimen unhealthy.
8. Unless otherwise specified, only mature adult specimens are eligible to compete.
9. If state or federal regulations apply, proper current permits must accompany entries.
10. Judges' decisions are final.

The "Herp of the Month" for the September meeting will be the North American box turtle. Any member of the genus *Terrapene* qualifies. The October meeting will feature the green iguana, *Iguana iguana*.

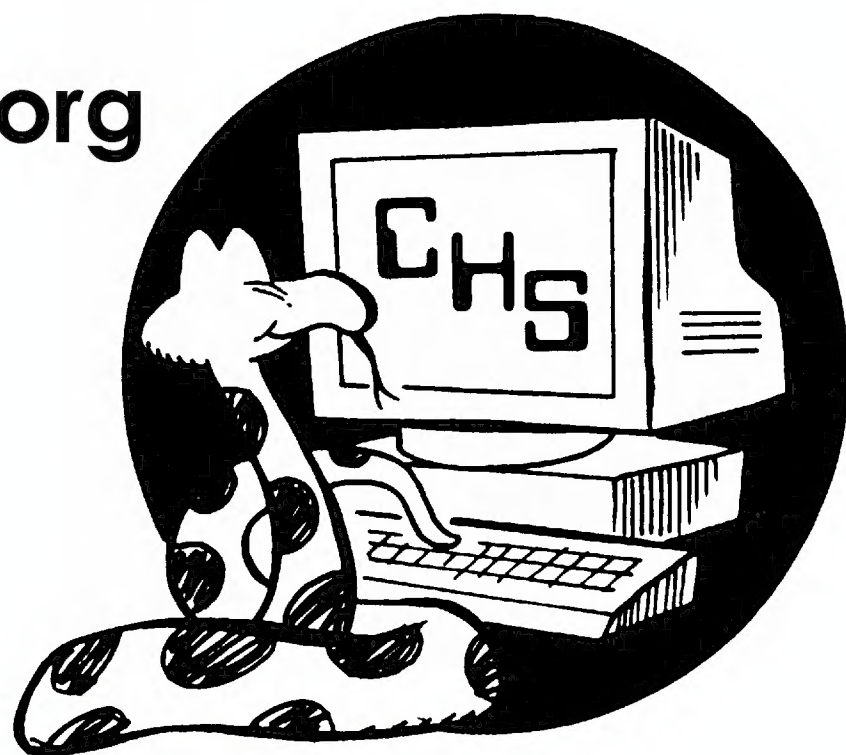
Members' comments and suggestions are welcome.

Next time you surf the WorldWide Web, crawl, run, slither, slide, jump, or hop over to the CHS web site!

www.chicagoherp.org

You'll find:

- Announcements
- CHS animal adoption service
- CHS events calendar & information
- Herp news
- Herp links
- Meeting/guest speaker information
- Photos of Illinois amphibians & reptiles
- Much, much more!



Chicagoherp.org is accepting applications for banner advertisements or links from herpetoculturists and manufacturers of herp-related products. Visit the site and contact the webmaster for details on how you can sponsor CHS!

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, September 26, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Andy Snider**, Curator of Herpetology at the Detroit Zoo, will speak about “The National Amphibian Conservation Center: From Concept to Completion.” Andy will touch on some of the highlights of the past year, and update us on future plans. He will also talk about some of the reptile-oriented programs at the Detroit Zoo.

The program for the October 31 meeting has not yet been determined.

The regular monthly meetings of the Chicago Herpetological Society now take place at Chicago’s newest museum — the **Peggy Notebaert Nature Museum**. This beautiful new building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the October 19 board meeting, to be held at the North Park Village Administration Building, 5801 North Pulaski Road, Chicago. To get there take the Edens Expressway, I-94, and exit at Peterson eastbound. Go a mile east to Pulaski, turn right and go south to the first traffic light. Turn left at the light into the North Park Village complex. At the entrance is a stop sign and a guardhouse. When you come to a second stop sign, the administration building is the large building ahead and to your left. There is a free parking lot behind the building.

The Chicago Turtle Club

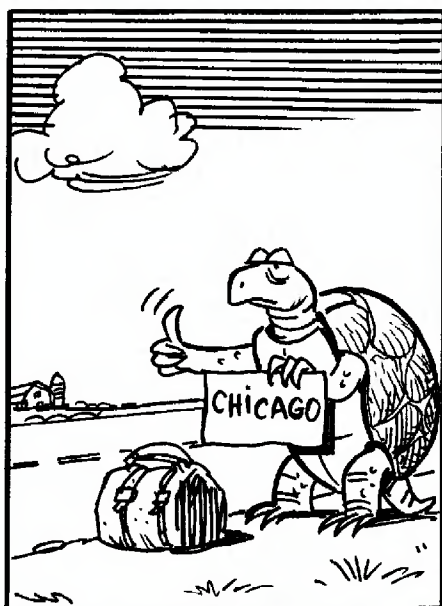
The next meeting of the Chicago Turtle Club will be on Sunday, September 30, 1:00 – 3:30 P.M., at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. This will be the “Touch a Turtle, Tickle a Tortoise” fall turtle show. Meetings are informal; questions, children and animals are welcome. Parking is free. For more info call Lisa Koester, (773) 508-0034, or visit the CTC website: <http://www.geocities.com/~chicagoturtle>.

DONATIONS TO THE JULY 25 RAFFLE

The following is a listing of those businesses and individuals who generously donated items for our monthly raffle at the July 25 meeting. The donated items are shown in parentheses.

Midwest Zoological Research (NutriBACdf supplement); **Lixit** (watering station); **Fluker** (iguana food); **Super Pet** (Floating Island / Rock Pool Cover / Island Sanctuary / ceramic dish); **Hagen** (OrnamentAlls cage decor / Prime supplement); **Lori King** (matted photo of a Galapagos marine iguana signed by **Martin Wikelski** / herps of Galapagos toy set / tortoise hand towels / malachite & ivory letter opener); **Craig and Gordon Bechtel** (snake hook); **Jack Schoenfelder—Reptiques** (hex aquarium / Mickey Mouse aquarium / plush frog); **Gary Fogel** (rubber snake); **Brian Jones** (fluorescent lights); **Karl and Erik Graff** (book: *The Visitor’s Guide to the Birds of the Central National Parks* / ceramic rock hide and water bowl); **Sally Hajek** (herp color prints); **Charlotte Henkle** (aquarium / screen top / light and fixture); **Dr. Cheryl Roge—Best Friends Animal Hospital** (heat rock); **Ilene Sievert** (cactus); **CHS** (T-shirts / drip watering system).

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